A re-evaluation of ‘disjoint’ footing

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1 Introduction

It has sometimes been suggested that a single language can make use of two distinct, but co-existent systems of foot structure:

• One system of foot structure to determine rhythmic stress placement.

• Another system of foot structure to determine phonological processes (vowel reduction, epenthesis, etc.) or allomorph selection.

\[
\begin{array}{c}
\text{Stress feet:} \\
(\sigma_s \sigma_w) \quad (\sigma_s \sigma_w) \quad (\sigma_s \sigma_w)
\end{array}
\]

\[
\begin{array}{cccccccc}
pa & pa & pa & pa & pa & pa & pa & pa
\end{array}
\]

\[
\begin{array}{c}
\text{Process feet:} \\
\{\sigma_s \sigma_w\} \quad \{\sigma_s \sigma_w\} \quad \{\sigma_s \sigma_w\}
\end{array}
\]

Table 1: Co-existent metrical tiers (schematically)


Huariapano, an extinct Amazonian language, is claimed to instantiate exactly this sort of pattern.

I will argue that this conclusion is premature: the prosodic phonology of Huariapano can be unified within a single system of metrical footing.

Second part of the talk:

• Provide typological support for the proposed analysis of Huariapano.

• Speculate about how to analyze other putative cases of ‘disjoint’ footing within a strict monoplanar framework.
2 Huariapano

Huariapano (= [wa.ɾi.a.pá.no]) is an extinct Panoan language, spoken in the Peruvian Amazon until the death of its last known speaker in 1991 (Parker 1994, Loos 1999).

The phonology of Huariapano exhibits two rhythmic phenomena:

- Alternating secondary stress:
  \[(1) \quad [\text{j̱.mmt.rn.a.nɔ.ʃi.ki}] \quad \text{‘he is going to hunt’}\]

- Alternating epenthesis of coda [hl]:
  \[(2) \quad [\text{̱h}.kα.ṯh.kaaj] \quad \text{‘they ate’}\]

Both of these processes are plausibly foot-based.

But the feet needed to determine rhythmic stress appear to be distinct from the feet needed for coda [hl] epenthesis (Parker 1994, 1998a,b, González 2005, 2007).

\[(3) \quad \begin{align*}
\text{a.} & \quad [\text{p̱h}.t^*a.j.ṉh.kaaj] \quad \text{‘they are washing’} \\
\text{b.} & \quad [\text{i̱h}.kα.s.ʃa̱j.kα.ti] \quad \text{‘you would shake with fear’}
\end{align*}\]

The proposal: stress and [hl] epenthesis can be integrated within a single system of footing, if we accept:

(i) A more flexible theory of language-internal variation in foot construction.
(ii) A richer view of how foot structure interacts with segmental phonotactics.

3 Phonology of Huariapano

Data and basic generalizations taken from Parker (1994, 1998a,b) and Parker (p.c.).

Transcriptions are altered from Parker (1994, 1998a,b) to better match IPA standards.

3.1 Syllable structure

Maximally [CGVC] (G = glide) and minimally [V].

\[(4) \quad \begin{align*}
\text{a.} & \quad [\text{hw̱n.ti}] \quad \text{‘heart’} \\
\text{b.} & \quad [\text{i̱.wi}] \quad \text{‘stingray’}
\end{align*}\]
3.2 Stress placement

3.2.1 Primary stress (quantity-sensitive)
Primary stress falls on the final syllable if heavy (= closed):

(5) a. [ja.wi] ‘opossum’ [LH]
    b. [hon.tis] ‘claw; fingernail’ [HH]

Otherwise, main stress falls on the penult:

(6) a. [á.ta] ‘manioc’ [LL]
    b. [wín.ti] ‘oar, paddle’ [HL]

(7) Quantity-sensitive primary stress placement in Huaria pano
a. /...σ H/ → [...σ H]
    b. /...σ L/ → [...σ L]

There are a small number of exceptions to this basic pattern:

(8) a. [jo.Buí] ‘witch’ [LL]
    b. [βwi.ní.kāj] ‘they are taking, carrying’ [LHLL]
    c. [βuí.ma.na] ‘face (noun)’ [LLL]

3.2.2 Secondary stress (quantity-insensitive)
Unlike primary stress, secondary stress is always quantity-insensitive in Huaria pano.

- Two distinct patterns of secondary stress assignment.
- Variation is lexical, not phonological (see Parker 1998a, Bennett 2012 for details).

Regular secondary stress (the most frequent pattern):
Assign secondary stress to every odd-numbered syllable, counting from the left.

(9) Regular secondary stress: [ð₁ σ₂ ð₃ σ₄ ð₅ σ₆ ...]
    a. [má.na.páj.ri] ‘I will wait’ ðσH L
    b. [wá.nuu.ki.ráj.ki] ‘they have returned’ ðσσHL
    c. [jó.muu.rà.no.sí.ki] ‘he is going to hunt’ ðσðσLL
Irregular secondary stress:
Assign secondary stress to every even-numbered syllable, counting from the left.

(10) Irregular secondary stress: \([ \sigma_1 \delta_2 \sigma_3 \delta_4 \sigma_5 \delta_6 \ldots ]\)

a. \( [\text{hi.màŋ.ko.ʃó}]\) 'species of ant' \(\sigma\delta\text{LL'}\)

b. \( [\text{a.ɾí.ʃah.káŋ.ki}]\) 'they repeated' \(\sigma\delta\sigma\text{H L}\)

c. \( [\text{bís.mà.noh.kò.no.sí.kì}]\) 'I forgot' \(\sigma\delta\sigma\delta\sigma\text{LL}\)

Stress clashes are completely disallowed.

(11) No clash in Huariapano

a. \( [\text{jò.mù.ru.nò.sìh.kàŋ}]\) 'they will hunt' \(\delta\sigma\delta\sigma\text{HH}\)

b. *\( [\text{jò.mù.ru.nò.sìh.kàŋ}]\)

3.3 Coda [h] epenthesis

Coda [h] is allowed in Huariapano, but must satisfy a handful of phonotactic constraints. (See Parker 1994, 1998a,b, de Lacy 2001, and Bennett 2012 for exhaustive discussion).

(i) Coda [h] must appear before a voiceless obstruent (coda [h] \(\approx\) preaspiration)

(12) a. \( [\text{pòh.ʃój}]\) 'I open'

b. \( [\text{ka.mòʃ}]\) 'species of venomous snake'

c. *\( [\text{kah.mòʃ}]\)

(ii) Coda [h] never appears in a coda cluster (because complex codas are prohibited)

(13) a. \( [\text{bòʃ.kà}]\) 'head'

b. *\( [\text{bòhʃ.kà}]\), *\( [\text{bòsh.kà}]\)

(iii) Coda [h] is rhythmic. Counting \(L \rightarrow R\):

- Coda [h] appears in all eligible odd-numbered syllables,
- and never appears in even-numbered syllables.

(14) Coda [h] in odd-numbered syllables only (counting \(L \rightarrow R\))

a. \( [\text{pàh.ʃaj.nìh.kàŋ}]\) 'they are washing' \(\checkmark\) 1st, 3rd \(\sigma\) coda [h]

b. \( [\text{pi.ní.kàŋ}]\) 'they are eating'

c. *\( [\text{pi.nìh.kàŋ}]\) \(X\) 2nd \(\sigma\) coda [h]
Coda [h] is obligatory wherever these conditions are met.

(15) a. [`ah.kom.pá.na] ‘rattlesnake’
b. *[`ah.kom.pá.na]

Coda [h] is always epenthetic rather than underlying.

- Distribution of coda [h] is non-contrastive, completely predictable, and rule-governed.

**Important observation:** coda [h] has the same basic distribution as regular secondary stress (odd-numbered syllables).

- Suggests an underlying structural unity between the two processes.

4 Disjoint footing in Huariapano?

Multiplanar account of the rhythmic phonology of Huariapano first proposed by Parker (1998a).


I call this approach the *multiplanar analysis of Huariapano* (or the *mah*).

Motivation for the *mah*:

- Coda [h] epentheses appear to be foot-based (it is rhythmic).

- If [h] epentheses depend on the same foot structure that determines stress, epenthesis should:
  - Always target stressed syllables (strong branch of foot), or
  - Always target unstressed syllables (weak branch of foot).

- This is incorrect:

(16) Epenthesis in stressed syllables \((\sigma_h = \sigma \text{ closed by coda } [h])\)

a. [p`ah.tsaj.níh.kä́j] ‘they are washing’ \(\hat{o}_h \sigma \hat{L}_h \hat{L}\)
b. [tf`h.ku.na.má́j] ‘corner’ \(\hat{o}_h \sigma \L \hat{H}\)
c. [jó.mu.r`h.kat`f`h.kä́j] ‘they hunted’ \(\hat{\sigma} \sigma \hat{o}_h \sigma \hat{L}_h \L\)
(17) Epenthesis in unstressed syllables
a. [ mah.tʰó.te ] 'broom' \( \sigma_h \ LS \)
b. [ βis.mà.noh.kò.no.ší.ki ] 'I forgot' \( \sigma \ \dot{o} \ \sigma_h \ \dot{o} \ \sigma \ LS \)

(18) Failure of epenthesis in stressed, even-numbered syllables
a. [ pah.tʰá.ku ] 'we washed' \( \sigma_h \ L \ L \)
b. *[ pah.tʰáh.ku ]

CONCLUSION: stress and epenthesis are both foot-based, but stress feet \( \neq \) epenthesis feet.

- Therefore the prosodic phonology of Huariapano employs multiple metrical tiers.

5 A unified account of Huariapano
The mah assumes that coda [h] epenthesis is determined by an autonomous metrical system, over and above the footing needed for stress placement.

Some critiques:

- No independent language-internal support.
  - The epenthesis tier is process-specific, and has no phonological consequences apart from epenthesis itself.
  - "It is a rule of thumb of practical ontology that a thing exists to the extent that other things interact with it, make use of it." (Prince 1983:31)

- Does not meaningfully capture distributional parallels between stress and coda [h] epenthesis.
  - If stress and epenthesis depend on completely orthogonal metrical systems, any similarities must be treated as accidental (or perhaps historical, e.g. Bach & Harms 1972; see also González 2003, 2007).

- Not very restrictive:
  - No underlying theory of multiplanarity (Hayes 1995).
  - Predicts improbable interactions between e.g. stress and vowel reduction.

\[
\begin{align*}
\text{Stress:} & \quad (p\acute{o} \ k\acute{a}) \ (t\acute{o} \ ki) \ (p\acute{o} \ t\acute{u}) \\
\text{V reduction:} & \quad \{\sigma_w \ \sigma_j\} \ \{\sigma_w \ \sigma_s\} \ \{\sigma_w \ \sigma_s\}
\end{align*}
\]
A unified account of rhythmic phenomena in Huariapano is possible, if we accept that:

(a) The headedness of feet is variable, but the position of foot boundaries is not.
(b) Coda [h] epenthesis targets foot-initial syllables — it is demarcative.

## 5.1 Stress placement: uniform parsing, variable headedness

### 5.1.1 Primary stress

I assume that the foot bearing main stress is **always bisyllabic** in Huariapano.

(19) Penultimate stress: right-aligned bisyllabic trochee

a. [ (βuí.na) ] ‘male’  
   \[/\ldots LL/ \rightarrow [...(L\l)] \]

b. [ (máj.ti) ] ‘hat’  
   \[/\ldots HL/ \rightarrow [...(HL)] \]

Final stress is the result of a *rhythmic reversal*: footing becomes iambic in order to stress a final heavy syllable.

(20) Final stress: right-aligned bisyllabic iamb

a. [ (ja.wíS) ] ‘opossum’  
   \[/\ldots LH/ \rightarrow [...(L\h)] \]

b. [ (hon.tíS) ] ‘claw; fingernail’  
   \[/\ldots HH/ \rightarrow [...(H\h)] \]

Evidence that final primary stress is assigned in a bisyllabic foot:

- **Argument 1**: There are no trisyllabic words with word-final main stress and initial secondary stress (though the facts are complicated; see Bennett 2012).

  (21) a. [ pa.βi.kín ] ‘ear’

  b. *[ pa.βi.kín ]

- Lack of secondary stress in (21) is surprising if final primary stress is assigned in a moraic trochee.

  (22) a. Iamb: [ pa(βi.kín) ]  
      \[L(L\h)# \]

  b. Trochee: *[ (pà.βi)(kín) ]  
      \[*(L\l)(H)# \]

- **Argument 2**: weight-based rhythmic reversals are attested in closely-related Panoan languages, some of which were mutually intelligible with Huariapano (Parker 1994, Loos 1999, Eliás-Ulloa 2006)
5.1.2 Regular secondary stress (odd syllables)
Regular secondary stress stems from L → R, QI trochees.

(23) Regular secondary stress: L → R syllabic trochees
    a. [ (mà.na)(pá.jì) ] ‘I will wait’
       \(\sigma \sigma \rightarrow \hat{H} L\)
    b. [ (jò.mùi)(rà.no)(sìh.káj) ] ‘they will hunt’
       \(\sigma \sigma \rightarrow \hat{H} L\)

5.1.3 Irregular secondary stress (even syllables)
I assume that irregular secondary stress parses out QI iambs, not trochees.

(24) Irregular secondary stress: L → R syllabic iambs
    a. [ (jú.mà)(ko.só) ] ‘spider’
       \(\sigma \sigma \rightarrow \hat{H} L\)
    b. [ (bìs.mà)(noh.kò)(nú.ì.kì) ] ‘I forgot’
       \(\sigma \sigma \sigma \rightarrow L L\)

Evidence for iambic secondary stress: even-parity words with a medial stress lapse.

(25) a. [ bù.tjà.nà.nà.nà.ká.tì ] ‘I found myself (face to face with the jaguar)’
    b. [ o.nà.ja.ma.káj.kì ] ‘they don’t know (how to speak Huariapano)’
    c. L → R iambic parse: \(\square \sigma \hat{\sigma} \sigma \hat{\sigma} \sigma L\)
    d. Trochaic parse (mah): * \(\sigma \sigma \hat{\sigma} \sigma \hat{\sigma} \sigma L\)

Variability in stress placement is always due to variability in the headedness of feet (iambic vs. trochaic).

- The slogan: foot headedness is variable in Huariapano; foot boundaries are not.

5.2 Coda [h] epenthesis
Footing is always bisyllabic in Huariapano, and always left-to-right (for secondary stress).

- An important consequence: odd-numbered syllables are always foot-initial.

(26) \([\sigma_1 \sigma_2 \sigma_3 \sigma_4 \sigma_5 \sigma_6]\ldots\]

Coda [h] epenthesis targets foot-initial syllables, even when unstressed.

Epenthesis is initial strengthening at the level of the foot.
5.3 When stress and epenthesis align

Epenthesis lines up with stress whenever:

(i) Footing is exhaustive (no stray unfooted syllables)

(ii) All feet are trochaic (so that stress is foot-initial)

(27) Regular secondary stress: L → R syllabic trochees
   a. [pāh.tʰaj.nih.kāj] ‘they are washing’ \((\tilde{o}_h \sigma)(L_h L)\)
   b. [tīh.ku.na.máj] ‘corner’ \((\tilde{o}_h \sigma)(L \tilde{H})\)
   c. [jō.mii.rāh.kā.tīh.kāj] ‘they hunted’ \((\dot{o} \sigma)(\tilde{o}_h \sigma)(L_h L)\)

5.4 Mismatches under iambic footing

Mismatches between stress and coda [h] epenthesis arise whenever footing is iambic (stress is foot-final).

5.4.1 Final primary stress (iambic head foot)

When main stress is word-final, epenthesis can occur in an unstressed penult.

(28) [nah.kā] ‘manioc beer’

Follows directly if feet are always bisyllabic: \((\sigma_h \dot{o})\#\)

(29) a. [nah.kā] ‘manioc beer’ \((L_h L)\)
   b. [jō.mii.rā.nəsih.kāj] ‘they will hunt’ \((\dot{o} \sigma)(\tilde{o}_h \sigma)(L_h \tilde{H})\)

Foot boundaries are fixed, so differences in iambic vs. trochaic main stress do not affect the position of epenthesis.

5.4.2 Irregular secondary stress (iambic non-head feet)

Stress and epenthesis often diverge under irregular secondary stress.

- Stress: foot-final → even-numbered syllables
- Epenthesis: foot-initial → odd-numbered syllables

(30) a. [ih.kās.tʕəj.kā.ti] ‘you would shake with fear’ \((\sigma_h \dot{o})\sigma(L \tilde{L})\)
   b. [bii.mā.noh.kō.ja.máj] ‘I have forgotten’ \((\sigma \dot{o})(\sigma_h \dot{o})(L \tilde{H})\)
5.5 Mismatches due to underparsing

If feet are always bisyllabic, then underparsing should occur whenever primary stress is preceded by an odd number of syllables.

(31) Underparsed antepenults: \((\hat{o}\sigma)(\hat{o}\sigma) \underline{\sigma}(\hat{o}\sigma)\)

The present account wrongly predicts that epenthesis should be blocked in these underparsed syllables.

(32) a. \([\text{jó} \text{mu} \text{ra} \underline{\text{ká} \text{no}}]\) ‘let’s go hunting’ \((\hat{o}\sigma)\underline{\sigma_h}(\hat{L} \ L)\)

b. \([\text{ha} \text{ja} \text{ji} \underline{\text{ká} \text{n} \text{ki}}]\) ‘(they) possessed, had’ \((\sigma \hat{o})\underline{\sigma_h}(\hat{H} \ L)\)

To remedy this problem, I propose that the antepenults in (32) are in fact footed — but not in the usual way.

Specifically: underparsed antepenults are recursively adjoined to the foot bearing primary stress.

(33) Recursively adjoined antepenults in Huariapano

a. \([\text{jó} \text{mu} \text{ra} \underline{\text{ká} \text{no}}]\) ‘let’s go hunting’ \((\hat{o}\sigma)(\sigma_h (\hat{L} \ L))\)

b. \([\text{ha} \text{ja} \text{ji} \underline{\text{ká} \text{n} \text{ki}}]\) ‘(they) possessed, had’ \((\sigma \hat{o})(\sigma_h (\hat{H} \ L))\)

Recursive adjunction of underparsed syllables solves the undergeneration problem.

- The problematic antepenults are no longer unfooted — instead, they are initial within a recursive foot.
- Epenthesis is correctly predicted to apply.¹

My claim: recursive adjunction is a last-resort strategy for ensuring exhaustive parsing.

- Without recursive footing, antepenultimate syllables in odd-parity words would be prosodically ‘trapped’ (Mester 1994), and left unfooted.
- Recursive adjunction thus serves to foot otherwise unfootable syllables.
- Independent evidence that Huariapano prefers exhaustive parsing: the existence of iterative secondary stress!

¹The recursion-based analysis I offer here could be straightforwardly recast using Hyde’s (2002, 2007, 2012) theory of overlapping feet. I opt for recursive feet instead because there is some independent evidence that Huariapano exploits recursive prosodic structure at other levels of the prosodic hierarchy (Bennett 2012). See also Martinez-Paricio (2012, in prep.).
Recursive footing of this sort has been proposed many times in previous literature.

- ‘Stray syllable adjunction’ (e.g. Prince 1976, Liberman & Prince 1977, Selkirk 1980, Hayes 1981, etc.)
- Prosodic morphology (McCarthy 1982, Yu 2004)
- Segmental phonotactics (Hammond 1997, Jensen 2000, Davis & Cho 2003, Harris 2013, Martínez-Paricio in prep.)
- Tonal distributions (Morén-Duolljá 2013, Martínez-Paricio in prep.)

An additional problem: stressed penults are not eligible for coda [h] epenthesis when preceded by an odd # of σs.

\[(34)\] No coda [h] epenthesis in stressed penults preceded by odd # of σs.

a. \[\text{pah.tʰá.kui}\] ‘we washed’ \(\sigma_h (\tilde{L} L)\)

b. *\[\text{pah.tʰáh.kui}\] \(*\sigma_h (\tilde{L}h L)\)

Both penults and antepenults should be foot-initial in trisyllabic words.

- Epenthesis wrongly predicted to occur in both positions, rather than just the antepenult.

These facts can be explained if epenthesis only targets \textit{maximal} feet (Jensen 2000, Yu 2003, Itô & Mester 1992/2003, 2009, 2010, et seq.).

\[(35)\] \textbf{Maximal foot} (\(F_{\text{max}}\); see Partee et al. 1990):
A foot not dominated by any other foot.

\[(36)\] Coda [h] epenthesis only targets initial syllables of \(F_{\text{max}}\)

a. \[\text{pah.tʰá.kui}\] \(\max \sigma_h (\min \tilde{L} L)\)

b. \[\text{rah.kui.tʃa.í.ki}\] \(\max \sigma_h \sigma (\min \tilde{L} L)\)

The intuition: epenthesis is limited to syllables that are \textit{strictly} foot-initial.

- Coda [h] epenthesis in Huariapano is a segmental cue to boundaries between successive feet.
- Similar phenomena are observed in English and Yupik languages (section 7.2).
6 Are epenthetic [h]s moraic?

If coda [h] epenthesis is foot-initial strengthening, how exactly does it contribute to the prominence of foot-initial syllables?

- One possibility (to be rejected): epenthetic [h]s are moraic (Parker 1994, 1998a,b)
- On this view, [h] epenthesis renders foot-initial syllables bimoraic: \((\sigma_h \sigma) = (\sigma_{\mu \mu} \sigma)\).
- Roughly analogous to stressed-syllable vowel lengthening or gemination.

But assuming a moraic basis for [h] epenthesis is untenable:

- If coda [h] is moraic, epenthesis must derive profoundly ill-formed feet.

\[(37)\]
\[
\begin{array}{ll}
\text{a. [nah\_ká] ‘manioc beer’} & (H_h \hat{L}) \\
\text{b. [poh\_sój] ‘I open’} & (H_h \hat{H})
\end{array}
\]


My counterproposal: coda [h] is not moraic in Huariapano.

- This derives from a more general property of the phonology:

**Only word-final consonants are moraic.**


What does this buy us?

- It derives the fact that only primary stress is quantity-sensitive:
  
  - Heavy syllables are restricted to final position.
  - Only the rightmost foot — the main stress foot — can contain a heavy syllable.
  - Secondary stress is trivially quantity-insensitive, because all non-final syllables are light.
  - No \([\ldots (\hat{H} \ L)]\) or \([\ldots (H \ \hat{H})]\) feet (cf. structures in section 5.1.1).

- There are no moraic/final [h]s in Huariapano, so coda [h] epenthesis never subverts the quantitative well-formedness of feet.\(^2\)

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\(^2\)Parker (1998b) conducts a phonetic study that purports to show that coda [h] is moraic in Huariapano. What Parker (1998b) actually establishes, however, is that coda [h]s are prosodically ‘the same’ as regular medial coda consonants — he does not in fact demonstrate that any medial codas are moraic. His phonetic findings are thus consistent with my claim that medial codas are non-moraic in Huariapano.
But if coda [h] is non-moraic, how does it augment foot-initial syllables?

Claim: coda [h] epenthesis increases the prominence of foot-initial syllables by maximizing the amount of segmental material those syllables contain.

- That is: epenthesis increases overall syllable duration, but in a non-moraic fashion.
- [CVh] syllables do have greater phonetic duration than open [CV] in Huariapano (though not quite as long as other [CVC] syllables; Parker 1998b).

Coda [h] epenthesis in Huariapano is thus a prosodically-determined but non-moraic strengthening process.

See Bennett (2012) for an OT implementation of these proposals.

7 Typological evidence for foot-initial prominence

Huariapano is not alone in treating foot-initial syllables as phonologically prominent.

Typological evidence suggests that foot-initial syllables may be subject to a range of strengthening phenomena.

7.1 Foot-internal gemination

Canela (Jê; Central/NE Brazil): intervocalic onset consonants undergo lengthening in stressed syllables, provided the pre-tonic vowel is short (Popjes & Popjes 1971, 1986).

Vowel length is contrastive, though it doesn’t carry a high functional load.

(38) Contrastive vowel length in Canela
   a. [ mā ] (benefactive)
   b. [ mā:] ‘rhea’ (species of bird)
   c. [ ka.tswa ] ’night’
   d. [ ka.tswa ] ’salt’

(39) Stressed onset lengthening: /CVC_xV/ → [CVC_x.C_xV]
   a. / kuhe / → [ kuh.’he ] ’abcess’
   b. / k5pi / → [ k5p.’pi ] ’try’
   c. / kum̩ kuheh̩n̩ ʊ̩ / → [ kum.’m̩ kuh.’he? ʊ̩ go ] ’give him another bow’
(40) No gemination after long vowels: /CV:CV/ → [CV:.CV]
   a. / ku:hе / → [ ku:.he ] ‘bow’
   b. / kе:rpa / → [ kе:.pa ] ‘sweep’
   c. / ha:klaun / → [ ha:.klun ] ‘he danced’

Stress is uniformly word-final in Canela (at least in nouns and verbs), which points toward iambic footing.

(41) a. [ (kuh.’he) ] ‘abcess’
    b. [ (ka.’tswa) ] ‘night’
   etc.

Interaction with preceding vowel suggests that lengthening yields a true ambisyllabic geminate.
- [CV:C] syllables are independently banned in Canela.

The analysis: gemination provides a coda for pretonic /CV/, thereby increasing the segmental content of foot-initial syllables
- Exactly analogous to Huariapano: foot-initial [CV] syllables are augmented with a closing coda.

(42) / kе:pi / → [ (kе:p.’pi) ] ‘try’

- There are even languages where gemination and preaspiration co-exist as strategies for closing stressed syllables (see Hayes 1995, González 2003, Bye & de Lacy 2008, Baal et al. 2012).

Foot structure provides a rationale for why stressed onsets lengthen in the first place.
- It’s clear that these geminates are ambisyllabic, not ‘pure’ moraic onsets (cf. Topintzi 2008).
- Onset gemination does not change the structure or content of the stressed syllable itself.
- So gemination cannot be driven by a pressure to augment stressed syllables (cf. Bye & de Lacy 2008).
- If gemination is structurally motivated, it must be determined by foot structure rather than syllable structure or stress alone (cf. Giavazzi 2010).

Very similar cases of stressed onset gemination can be found in Karo and Kaapor, two unrelated Amazonian languages (Bennett 2012).
7.2 Non-quantitative fortition

Yupik languages are well-known for having fortition processes that demarcate foot edges (Leer 1985a,b,c, Jacobson 1985, Hayes 1995, van de Vijver 1998, etc.)

Norton Sound Yupik:

- Iambic footing (L → R parsing)
- Phonemic contrast between voiced fricatives / v z ñ / and approximants / w j l /.

\[(43)\] a. / qajani / → [ qa.'ja:ni ] ‘his own kayak’
   b. / kuvluni / → [ 'kuv.lu:ni ] ‘it spilling’

Voiced fricatives and approximants neutralize to voiced fricatives in foot-initial position.

\[(44)\] Foot-initial fortition in Norton Sound Yupik\(^3\)
   a. / w j l / → [ v z ñ ] / (Fr __ __ __ __)
   b. [ (ma.'juy)(yik) ] ‘place to go up’
   c. [ ('at)(xay.wik) ] ‘place to go down’
   d. [ (ma.'juy)(zux.tuq) ] ‘he wants to go up’
   e. [ ('at)(xay.'jux)(tuq) ] ‘he wants to go down’

A species of stricture-increasing (or sonority-decreasing) fortition (e.g. Smith 2005).

The context for fortition can (almost) be stated in terms of stress: approximants become voiced fricatives in post-tonic syllables.

- But typologically, post-tonic position is a locus for weakening, not strengthening (Lavoie 2001, González 2003, Gurevich 2004).

Foot structure rationalizes fortition.

- Foot-initial position is phonologically prominent.
- Fortition targets phonologically prominent positions:
  - Cf. Guyabero: /w/ → [β] in onset of a stressed syllable (Lavoie 2001:43)

\(^3\)Word-final syllables do not receive stress in Norton Sound Yupik, even when the distribution of foot-sensitive fortition indicates that they are parsed as the strong branch of an iambic foot. See Hayes (1995), van de Vijver (1998), and references therein.
For an exactly parallel fortition process in a different variety of Yupik, Leer (1985b:84) observes that “systematically and phonetically, word-initial consonants are fortis”.

- Word-initial ≠ post-tonic.
- The foot-based analysis of Yupik fortition eliminates the need for an uninformative disjunctive context.

Other instances of non-quantitative foot-initial strengthening include:

- Allophonic aspiration in English (Jensen 2000, Davis & Cho 2003)
- Low-level phonetic lengthening in Japanese affricates (Shaw 2007).

### 7.3 Expanded inventories

#### 7.3.1 Dynamic reduction


\[(45)\] Pre-tonic [ã] in some Central Russian dialects (Crosswhite 2000)

a. \[\text{[} 's\_\_t\text{]}\] ‘garden (nom. sg.)’
b. \[\text{[} s\_\_d\text{.a}.'vot\text{]}\] ‘gardener (nom. sg.)’
c. \[\text{[} 'd\_\_t\text{]}\] ‘to give’
d. \[\text{[} d\_\_d.'vat\_\_\text{]}\] ‘to give (iterative)’

Consistent with iambic footing and foot-sensitive vowel reduction: \((\sigma \bar{\sigma})\).

\[(46)\]

a. \[\text{[} s\_\_g(\text{da}.'\text{vot})\text{]}\]
b. \[\text{[} (\text{da}.'\text{vat})\text{]}\]

- See Gouskova (2010) for an overview of past proposals along these lines.

Low vowel \([a]\) is relatively sonorous, and tends to be licensed in phonologically prominent positions (de Lacy 2002, 2004, 2007).

- Another plausible case of foot-initial prominence.
- Otherwise, this pattern goes against the clear typological preference for *low*-sonority vowels in unstressed, footed syllables.  

In some dialects, the vowel inventory of pre-tonic syllables interacts with the following stressed vowel: pre-tonic [a] is disallowed when the stressed vowel is non-high.

(47) ‘Dissimilative’ vowel reduction in some Southwest Russian dialects (Nesset 2002)

a. \(/ \text{p}^\text{i} \text{a}^\text{t}^\text{j} + \text{ak} \rightarrow [ \text{p}^\text{i} \text{a} \text{t}^\text{k} ] \) ‘five-kopeck coin’

b. \(* [ \text{p}^\text{i} \text{a} \text{t}^\text{k} ]\)

Cf.

c. \(/ \text{p}^\text{i} \text{a}^\text{t}^\text{j} + \text{i} \rightarrow [ \text{p}^\text{i} \text{a} \text{t}^\text{i} ] \) ‘five (gen. sg.)’

• More evidence for a rhythmic grouping of pre-tonic and tonic vowels.

Pretonic vowel is also phonetically prominent (Crosswhite 2000:116, Padgett & Tabain 2005)

• Resists deletion and devoicing in fast speech.

• Longer in duration than other unstressed vowels of the same quality.

The distribution of vowel quality in Russian provides more evidence that foot-initial unstressed syllables are phonologically prominent.

7.3.2 Static contrast

Static phonotactics also suggest that foot-initial syllables license a greater range of contrasts than other unstressed syllables.

• San Martin Itunyoso Trique (DiCanio 2008:Ch. 2,5; tones omitted):

  o Fixed word-final stress → iambic footing

(48) a. \([ \text{nu.kw}^\text{a?}) \] ‘word’

b. \([ \text{sma.te.}\overline{\text{e})} \] ‘rat’

c. \([ \text{ru(\text{f}j}^\text{i,j\text{a})} \] ‘pomegranate’

  o Asymmetric consonant licensing:

    — Final (stressed) [\(\sigma(\overline{\sigma})\)]: 29 contrastive consonants

    — Pretonic (foot-initial) [\(\sigma(\overline{\sigma})\)]: 15 contrastive consonants

    — Antepenult (unfooted) [\(\overline{\sigma}(\sigma)\)]: 10 contrastive consonants

• Exactly analogous positional restrictions hold for the distribution of contrastive vowel qualities and contrastive tone.
8 Other cases of ‘disjoint’ footing

Ingredients for a monoplanar account of rhythmic phonology in Huariapano:

- Consistent foot parsing
- Flexible foot-form (variable headedness, recursion, etc.)
- A structurally-determined foot-based phonotactic (e.g. foot-initial prominence).

Can this basic approach be generalized to other putative cases of ‘disjoint’ footing?

8.1 Eastern Mari

Eastern (or ‘Meadow’) Mari seems to dissociate stress and footing (Vaysman 2009):

- Stress falls on the rightmost full vowel (49a-c), otherwise the initial vowel (49d).

\[(49)\]
\[\begin{align*}
a. & \quad [ j\text{ó}.\eta.g\text{ól}\tilde{s} ] \text{‘mistake’} \\
b. & \quad [ pu.\tilde{s}\text{át}.g\text{ó} ] \text{‘tree’} \\
c. & \quad [ k\text{ö}.\tilde{g}\text{ór.čén} ] \text{‘dove’} \\
d. & \quad [ \beta\text{ó}.n\text{ó} ] \text{‘canvas’}
\end{align*}\]

- Word-final /\#/ ‘vocalizes’ to a full vowel iff in an even-numbered syllable.

\[(50)\]
\[\begin{align*}
a. & \quad [ t\tilde{e}.g\text{óz-l\tilde{ó} } ] \text{‘naval’} \\
b. & \quad [ \tilde{š}\text{ó}.g\text{ó}.l\tilde{ó}k-l\tilde{ó} ] \text{‘senile’}
\end{align*}\]

- Syllable-counting character of vocalization suggests conditioning by foot structure.

\[(51)\]
\[\begin{align*}
a. & \quad / t\tilde{e}g\text{óz-l\tilde{ó} } / \rightarrow [ (t\tilde{e}.g\text{óz})l\tilde{ó} ] \\
b. & \quad / \tilde{š}\text{ó}g\text{ó}l\tilde{ó}k-l\tilde{ó} / \rightarrow [ (\tilde{š}\text{ó}.g\text{ó})(l\tilde{ó}k.l\tilde{ó}) ]
\end{align*}\]

- An opacity issue not dealt with here: vocalized /\#/ does not attract stress.
- I also abstract away from some morphological factors and vowel harmony.

Vaysman (2009:87,97):

“Metrical boundaries and [the] position of stress do not match... prominence and constituency [are] two different entities in the grammar”

But “differs from” is too strong here: Mari has stress that is indiFFerent to default footing, not distinct from footing altogether.

- Constraints on the location of primary stress simply outweigh preferences for particular types of foot structure.
(52) Parsing $L \rightarrow R$ bisyllabic feet:
\[ \text{FtBin} \gg \text{Parse}(\sigma) \gg \text{AllFtL} \gg \text{AllFtR} \]

<table>
<thead>
<tr>
<th></th>
<th>FtBin</th>
<th>Parse($\sigma$)</th>
<th>AllFtL</th>
<th>AllFtR</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. (pa.re)(\eta.na,so)</td>
<td>*</td>
<td>**</td>
<td>*</td>
<td>***</td>
</tr>
<tr>
<td>b. (pa.re)\eta(na.so)</td>
<td>*</td>
<td>***! W</td>
<td>*** L</td>
<td></td>
</tr>
<tr>
<td>c. (pa.re)\eta.na.so</td>
<td>*<em>!</em> W</td>
<td>L</td>
<td>*** L</td>
<td></td>
</tr>
<tr>
<td>d. (pa.re)(\eta.na)(s)</td>
<td>*! W</td>
<td>L</td>
<td>** *** W</td>
<td>* ***</td>
</tr>
</tbody>
</table>

[ pa.re.\eta.na.s ] ‘the one who is our potato’

(53) Rightmost underlying full vowel stressed: EndRuleR and Iamb

a. / peledaš /
<table>
<thead>
<tr>
<th></th>
<th>EndRuleR</th>
<th>IAMB</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. (pe.lé)daoš</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. (pé.le)daoš</td>
<td>*! W</td>
<td></td>
</tr>
</tbody>
</table>

[ pe.lé.daoš ] ‘flower’

b. / ojlomaš-lo /
<table>
<thead>
<tr>
<th></th>
<th>EndRuleR</th>
<th>IAMB</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. (oj.lø)(máš.lo)</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. (ój.lø)(maš.lo)</td>
<td>*! W</td>
<td>*</td>
</tr>
</tbody>
</table>

[ oj.lø.máš.lo ] ‘fictional’

Avoidance of stressed [ɜ] is due to a licensing constraint on low-sonority prosodic word heads.

(54) Coincide([ɜ], $\sigma_1$):
Assign one violation for every instance of [ɜ] outside the word-initial syllable.

(55) Stress attracted to full vowels over /\ø/:
\[ \text{Coincide}([\epsilon], \sigma_1) \gg \text{EndRuleR} \gg \text{Iamb} \]

a. / kujužan-oško /
<table>
<thead>
<tr>
<th></th>
<th>Coincide([\epsilon], $\sigma_1$)</th>
<th>EndRuleR</th>
<th>IAMB</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. (ku.gu)(žá.noš)kø</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. (ku.gu)(ža.noš)kø</td>
<td>*! W</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>c. (ku.gú)(ža.noš)kø</td>
<td>*! W</td>
<td>L</td>
<td></td>
</tr>
</tbody>
</table>

[ ku.gu.žá.noš.kø ] ‘princess (illative sg. non-possessive)’
Disjoint footing Bennett

b. / joŋalos-lo / | COINCIDE([∠], σ₁) | EndRuleR | IAMB
  a. ʃə (jó.ŋə)(laš.lo) | * | * |
  b. ʃə (jó.ŋə)(laš.lo) | *! W | L | *

[ jó.ŋə.laš.lo ] ‘wrong’

COINCIDE([∠], σ₁) also captures default-to-opposite behavior (initial stress) in words without any full vowels (see (62) below).

Preference for iambs and rightmost main stress is not strong enough to affect foot parsing.

(56) Parsing imperatives take precedence over default headedness

a. Parse(σ) ≫ IAMB

<table>
<thead>
<tr>
<th>/ kuğužan-oskə /</th>
<th>COINCIDE([∠], σ₁)</th>
<th>Parse(σ)</th>
<th>AFL</th>
<th>EndR</th>
<th>IAMB</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ʃə (ku.gu)(žá.noš)kə</td>
<td>*</td>
<td>*</td>
<td>**</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. ku(gu.žá)noš.kə</td>
<td>*<em>!</em> W</td>
<td>* L</td>
<td>L</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b. Parse(σ) ≫ EndRuleR

<table>
<thead>
<tr>
<th>/ joŋalos-lo /</th>
<th>COINCIDE([∠], σ₁)</th>
<th>Parse(σ)</th>
<th>AFL</th>
<th>EndR</th>
<th>IAMB</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ʃə (jó.ŋə)(laš.lo)</td>
<td></td>
<td>*</td>
<td>**</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>
| b. ʃə (jó.ŋə)laš.lo | | *!* W | L | L | *

What about final stress?

- The analysis doesn’t yet account for final stress in odd-parity words:

  (57) [ kö.gōr.čén ] ‘dove’

- Final syllable in (57) should be unfooted, and therefore unstressed.

  (58) Predicted structure: [ (kö.gōr)čén ]

Additional mechanism needed: some constraint favoring right-aligned main stress.

(59) Anchor-R(∠):
Assign one violation if main stress falls on a non-final syllable.

5Underlying / -oskV_mid / is transcribed with final [ɔ] here to show that this suffix does not attract stress. This illative suffix does not participate in /ɔ#/ vocalization.
(60) Imperfectly aligned feet allowed under duress:
ANCHOR-R(ό) ≫ ALLFtL

<table>
<thead>
<tr>
<th>/ kögörčen /</th>
<th>ANCHOR-R(ό)</th>
<th>FtBin</th>
<th>Parse(σ)</th>
<th>ALLFtL</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. kö görčén</td>
<td></td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>b. (kö,gór)čen</td>
<td>*! W</td>
<td></td>
<td>*</td>
<td>L</td>
</tr>
<tr>
<td>c. (kö,gór)(čén)</td>
<td>*! W</td>
<td></td>
<td>L</td>
<td>** W</td>
</tr>
</tbody>
</table>

- When stress falls on an underlying, word-final full vowel, /ɔ#/ vocalization is not at issue.
- Building an imperfectly aligned foot in these words has no consequences for the surface distribution of [ɔ].

Underlying /ɔ/ can't bear stress on the surface.
- Nothing is gained by constructing a misaligned foot when the final vowel is /ɔ/.
- Foot parsing will follow the default L → R pattern in such cases.
- This correctly predicts the distribution of /ɔ#/ vocalization.

(61) Misaligned feet under final stress only

a. Odd-parity words: no vocalization of /ɔ#/

<table>
<thead>
<tr>
<th>/ mardež-łə /</th>
<th>ANCHOR-R(ό)</th>
<th>FtBin</th>
<th>Parse(σ)</th>
<th>ALLFtL</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. mar.déž)lə</td>
<td></td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>b. mar déž,lo</td>
<td></td>
<td></td>
<td>*</td>
<td>*! W</td>
</tr>
<tr>
<td>c. mar.déž)(lo)</td>
<td>*! W</td>
<td></td>
<td>L</td>
<td>**</td>
</tr>
</tbody>
</table>

[ mar.déž.lə ] ‘windy’

b. Even-parity words: vocalization of /ɔ#/ occurs

<table>
<thead>
<tr>
<th>/ üremo-łə /</th>
<th>ANCHOR-R(ό)</th>
<th>FtBin</th>
<th>Parse(σ)</th>
<th>ALLFtL</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ü ré)(ma,le)</td>
<td></td>
<td></td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>b. ü(ré,ma)lo</td>
<td></td>
<td></td>
<td>**! W</td>
<td>L</td>
</tr>
<tr>
<td>c. (ü ré)mə,lo</td>
<td></td>
<td></td>
<td>**! W</td>
<td>L</td>
</tr>
</tbody>
</table>

[ ü.re.mə,le ] ‘street (adj.)’
Default-to-opposite behavior: when all vowels are /ə/, stress is word-initial.

- Already captured by $\text{COINCIDE}([\ddot{o}], \sigma_1)$.

\begin{align*}
\text{(62) } & \text{Stressed } [\ddot{o}] \text{ must be word-initial: } \text{COINCIDE}([\ddot{o}], \sigma_1) \text{ undominated} \\
\begin{array}{|c|c|c|}
\hline
/\text{pòròs}/ & \text{COINCIDE}([\ddot{o}], \sigma_1) & \text{ANCHOR-R}(\ddot{o}) \upharpoonright \text{IAMBR} \\
\hline
\text{a. pò.́ròs} & * & * \\
\text{b. pò.́ròs} & *! \text{ W} & \text{L} \upharpoonright \text{L} \\
\hline
\end{array}
\end{align*}

\[ [ \text{pòròs}] \text{ ‘cat’} \]

Figure 1: Hasse diagram for active constraints in reanalysis of Eastern Mari

As Vaysman (2009:65,95) observes:

“stress assignment . . . does not seem to take the foot structure into account, but is rather based on different principles . . . stress can be placed on either [the] right or left syllable of a foot, and there are feet without a stressed syllable in them at all”

Vaysman interprets this result as unequivocal evidence that stress and footing depend on distinct representational systems (see also Blumenfeld 2006:129-132).

But the preceding analysis shows (pace Vaysman 2009) that stress and footing in Eastern Mari can be captured within a single representational system.

- Eastern Mari once again demonstrates that segmental phonotactics can refer directly to metrical structure rather than stress.

- It does not follow that metrical constituency is distinct from stress assignment in the grammar.
  - Foot-sensitive phonotactics may be indifferent to stress placement, if based on linear position within the foot (as in Huariapano and Eastern Mari).
  - Predicts little or no correspondence between stress and segmental patterning.
• Eastern Mari shares some crucial properties with Huariapano:
  ◦ Foot-parsing is (roughly) uniform.
  ◦ Foot-headedness is variable, as conditioned by extraneous phonological and morphological factors.
  ◦ A segmental process (/ə#/ vocalization) depends on constituency rather than stress.
  ◦ This creates a spurious ‘mismatch’ between stress and foot structure.
  ◦ All of this is predicted by free permutation of independently-needed constraints.

• Eastern Mari requires the additional assumption that feet can be unstressed, or ‘covert’.
  ◦ Also true of Vaysman’s (2009) account . . .

8.2 Tübatulabal
Not all apparent cases of disjoint footing can be resolved by recourse to flexible footing.

The interaction of stress and vowel length in Tübatulabal (= [tɪ.bátu.la.bál]) is less amenable to a monoplanar analysis.

• The problem: it seems that two strikingly different systems of footing are co-existent in the phonology.

Alternating Length (AL):
Vowel length is phonemic.⁶

(63) a. [kin.nan] ‘to bring it for him’
    b. [pu.wa:n] ‘to irrigate it for him’
    c. [ha:.ya:n] ‘to stir it for him’

⁶Examples are from Voegelin (1935a,b), Swadesh & Voegelin (1939), and Voegelin (1958), but are re-transcribed according to the conventions and analysis of McCawley (1969) and Heath (1981). The effects of a ‘late rule’ of allophonic consonant gemination are not shown, because it would obscure important interactions between vowel length and underlying geminates.

See also Lightner (1971), Crowhurst (1991), Manaster Ramer (1992), Hayes (1995), Aion (2003) and sources cited there. Voegelin & Voegelin (1977) mention that the prosody of Tübatulabal, which has been moribund for several decades, has changed drastically since the early 20th century.
Rhythmic vowel lengthening (slightly simplified):

- \( /CV/ \rightarrow [CV:] \) in odd-numbered syllables, counting from left-to-right, unless the vowel is word-final.
- AL also applies in odd, word-final \( /CVC/ \) syllables, depending on the coda.

(64) Alternating Length (AL): \( L \rightarrow R \) alternation

a. \([\text{ta}\.\text{wi}\.\text{gi}\.\text{na}\.\text{na}\.\text{la}]\) ‘to go along causing him to see’
b. \([\text{?a}\.\text{da}\.\text{wi}\.\text{qi}\.\text{na}\.\text{na}\.\text{la}]\) ‘he went along causing him to see’
c. \([\text{tik}\.\text{ka}\.\text{ma}\.\text{la}]\) ‘let us eat’
d. \([\text{tik}\.\text{ka}\.\text{la}\.\text{ma}\.\text{la}]\) ‘let us go eat’
e. \([\text{tik}\.\text{ki}\.\text{lo}\.\text{go}\.\text{ma}\.\text{la}]\) ‘let us go and pretend to eat’
f. \([\text{?e}\.\text{we}\.\text{ha}\.\text{m}]\) ‘to lick for him’
g. \([\text{?it}\.\text{ti}\.\text{si}\.\text{ban}]\) ‘to scrape for him’

AL does not apply in syllables that are adjacent to an underlying \( /CV:/ \) syllable:

(65) 

\(/ pphi:n-/ \)
a. \([\text{pi}\.\text{hi}\.\text{ni}\.\text{watt}]\) ‘it is breaking (when he pulls it)’
b. \(*[\text{pi}\.\text{hi}\.\text{ni}\.\text{watt}]\)
c. \(*[\text{pi}\.\text{hi}\.\underline{\text{ni}}\.\text{watt}]\)

Cf. \(/ ppolloNa-/ \)
d. \([\text{?op}\.\text{pol}\.\underline{\text{lo}}\.\text{jan}]\) ‘to beat it for him (perfective)’

Possible analysis: AL targets the heads of bimoraic trochees, parsed \( L \rightarrow R \).

- Heavy syllables restart the count as a kind of abstract clash avoidance.

<table>
<thead>
<tr>
<th>Gloss</th>
<th>‘he is causing him to see’</th>
<th>‘he is causing him to talk’</th>
</tr>
</thead>
<tbody>
<tr>
<td>/UR/</td>
<td>/ tawika-(i)na-tt /</td>
<td>/ ala:w-(i)na-tt /</td>
</tr>
<tr>
<td>Footing</td>
<td>(ta.wi)(gi.natt)</td>
<td>?a(la:w)(i)na(t)</td>
</tr>
<tr>
<td>AL</td>
<td>(ta.wi)(gi.natt)</td>
<td>—</td>
</tr>
<tr>
<td>[SR]</td>
<td>[ ta.wi.gi.natt ]</td>
<td>[ ?a.la.wi.natt ]</td>
</tr>
</tbody>
</table>

Figure 2: Possible foot-based derivation of Alternating Length in Tübatulabal
But stress assignment follows a different set of principles (see Prince 1983, Hayes 1995).\(^7\)

- Stress falls on the final vowel,
- and on every long vowel,
- and on even-numbered short vowels, counting *right to left* from the final syllable and from stressed heavy syllables.

\[(66)\] Stress: \([\hat{V}:]\) and R → L alternation

\[\begin{align*}
a. & \quad [\text{tik.kap.pi.ga.nan}] \text{ ‘the one who was eating’} \\
b. & \quad [\text{pit.tit.pit.ti:di.nat}] \text{ ‘he is turning it over repeatedly’} \\
c. & \quad [\text{tsi:mi.mi?:i:at}] \text{ ‘it shines (from being polished)’} \\
d. & \quad [\text{n0:?:i:at.ksi:wan}] \text{ ‘his partner in turning back’}
\end{align*}\]

AL transparently feeds stress assignment, but the two processes apparently make use of different feet.

\[(67)\] / tikk-amala / ‘let us eat’

\[\begin{align*}
a. & \quad \text{AL: } [\text{(tik.ka)(ma:la)}] \\
b. & \quad \text{stress: } [\text{(tik.ka)(ma:)(la)}]
\end{align*}\]

\[(68)\] / no-atksi:wa-n / ‘his partner in turning back’

\[\begin{align*}
a. & \quad \text{AL: } [\text{(no:?:at)(ksi:wan)}] \\
b. & \quad \text{stress: } [\text{(n0:)(?:at.ksi):(wan)}]
\end{align*}\]

It seems unlikely that AL and stress assignment can be reconciled within a single system of footing.

So what analytic options remain?

1. Accept the existence of disjoint footing (as Aion 2003 does).
3. Deny, deny, deny: re-examine the empirical basis of AL.

---

\(^7\)Some nouns have fixed stress, including fossilized compounds that deviate from the normal stress assignment rules (Voegelin 1935a:78, Heath 1981:211). Heath (1981:211) points out that certain coda clusters may attract stress as well. There is some uncertainty over the location of primary stress; see Hayes (1995) for discussion.
Tübatulabal prosody in derivational terms:

- AL transparently feeds stress assignment.
- So why not order AL before stress assignment in a serial derivation?

<table>
<thead>
<tr>
<th>Gloss</th>
<th>‘let us eat’</th>
<th>‘his partner in turning back’</th>
</tr>
</thead>
<tbody>
<tr>
<td>/UR/</td>
<td>/ tikk-amala /</td>
<td>/ no-atsiŋwa-n /</td>
</tr>
<tr>
<td>Footing</td>
<td>(tík.ka)(má:la)</td>
<td>(nó:ʔa)(tsiŋ.wan)</td>
</tr>
<tr>
<td>AL</td>
<td>(tík.ka)(má:la)</td>
<td>(nó:ʔa)(tsiŋ.wan)</td>
</tr>
<tr>
<td>Re-footing</td>
<td>(tík.ka)(má:)(lá)</td>
<td>(nó:ʔá.tsiŋ)(wán)</td>
</tr>
<tr>
<td>[SR]</td>
<td>[ tík.ka.má: lá ]</td>
<td>[ nó:ʔá.tsiŋ.wán ]</td>
</tr>
</tbody>
</table>

Figure 3: Possible serial analysis of Tübatulabal prosody

If the derivational approach is correct, then the Tübatulabal facts may help us evaluate the merits of different serial frameworks.

- Not all derivational theories are equally well-equipped to deal with changes in foot parsing.
- Stumbling block: the Free Element Condition (or other similar principles).
  - The idea that metrical structure, once built, may not be changed.
  - Strong versions of the FEC present serious difficulties for a serial analysis of AL and stress in Tübatulabal.

- Other languages that might require two independent stages of foot parsing:
  - Tiberian Hebrew (Rappaport 1984, Churchyard 1999, Dresher 2009)
  - Onondaga and other Lake Iroquoian languages (Michelson 1988)
  - Jarawara (Dixon 2004:§§2.6, 2.9)

But the truth may be more mundane:

- There is reason to suspect that AL was no longer synchronically productive at the time of Voegelin’s fieldwork.
- Evidence: the application of AL is both highly irregular and massively opaque (see Sanders 2003 for related discussion of Polish).
Rampant exceptions (see also Manaster Ramer 1992):

- **Underapplication:**

  (69) Underapplication in initial syllables

  a. [ši.doʔ.doʔ] ‘to slide’  
  b. [ʔu.gan] ‘the patch (of plants)’
  c. [ʔu.gan.wit] ‘to get ready’  
  d. [to.go.go:] ‘it is popping’
  e. [tši.bi.biʔ] ‘it shines (reflected light)’  
  f. [ʔi.giš.pil] ‘small amount’
  g. [ka.bo.baʔ] ‘it is rattling’  
  h. [mi.gi.tih] ‘mythical character’
  i. [ni.baʔ] ‘it is snowing’  
  j. [ti.bat] ‘pine nuts’
  k. [ʔo.gon] ‘empty word’  
  l. [pi.gat] ‘the stone knife’
  m. [pi.ʔa.ʔa] ‘the water is splashing’  
  n. [po.goh] ‘the borrowing owl’

  (70) Underapplication in medial syllables

  a. [tik.kap.pi.ga.nan] ‘the one who was eating’  
  Cf. [ʔa.na.bi:.wat] ‘he is being thrown’
  b. [ʔi.ši.wa.nat] ‘he is combing his hair for him’  
  Cf. [ta.wi.ga.nat] ‘he is seeing for him’

- **Wrong syllable targeted:**

  (71) a. /ʔʔi.w-an/ → [ʔi.wa:n] ‘to trap for him’
  b. /pin-an/ → [pi.na:n] ‘to bring it for him’
  c. /ʔʔop-an/ → [ʔo.ba:n] ‘to dive for him’
  Cf.
  d. /taŋ-an/ → [ta.ŋan] ‘it rains for him’
  e. /noh-an/ → [no.han] ‘to roast in the ground for him’

- **Variable blocking by singleton [ʔ]** (Swadesh & Voegelin 1939, McCawley 1969):

  (72) a. [haʔit] ‘to hear’
  b. [ʔaʔay] ‘to pick it from the ground’
  c. [ʔiʔi.diʔa] ‘to loan’
  Cf.
  d. [neʔiʔin] ‘to depend on him’
  e. [ʔiʔi.ma] ‘to tie bands’

- Other consonants and clusters have a sporadic, lexically-specific blocking effect as well (Heath 1981:209-10).

A few exceptions involve the “synchronously deviant behavior of certain morphemes... of foreign origin” (Manaster Ramer 1992:fn.11).

- Suggests that AL was not productively extended to loanwords.

Some of these counter-examples can probably be explained away, but not all of them.

- Extant solutions involve abstract URs of dubious synchronic validity:
  - Underlying long vowels and geminates that always surface as short (Swadesh & Voegelin 1939, Heath 1981).
  - Underlying consonants that never surface at all (Swadesh & Voegelin 1939, Manaster Ramer 1992).
  - Underlying /V?V/ sequences that always surface as ‘fused’ [V] (Swadesh & Voegelin 1939).

**Massive opacity:**
The regular application of AL is rendered opaque by several different processes:

- **Syncope:**

  \[(73)\]
  a. \(\text{red-poha-n} \rightarrow [\text{?op.ha:n}]\) ‘to smear for him’
  b. *\([\text{?o.po.ha:n}]\)
  c. *\([\text{?op.han}]\)

- **High vowel epenthesis, /y?/ \(\rightarrow [yi?]\) (Lightner 1971):**

  \[(74)\]
  a. \(/\text{bay?gi-la} \rightarrow [\text{ba.yi?.gi.la}]\) ‘to go along turning’
  b. *\([\text{ba.yi?.gi:.la}]\)

- **Gemination of final plosives:**

  \[(75)\]
  a. \(/\text{šak} \rightarrow [\text{ša:kk}]\) ‘to roast it’
  Cf.
  b. \(/\text{red-palakk} \rightarrow [\text{?a.pa.lakk}]\) ‘to throw it (perfective)’
  c. *\([\text{?a.pa.la:kk}]\)

  \[(76)\]
  a. \(/\text{red-tišip} \rightarrow [\text{?i.ti.ši:pp}]\) ‘to scrape deer-skin (perfective)’
  Cf.
  b. \(/\text{patwanapp} \rightarrow [\text{pa:.twa.napp}]\) ‘three o’clock’
  c. *\([\text{pa:.twa.na:pp}]\)
The derivational solution almost works because it recapitulates the historical development of Tübatulabal.

- AL *literally* preceded the current system of stress assignment.
  - Lengthened vowels correspond to vowels that previously carried stress.
  - Some exceptional instances of AL correspond to morphemes that bore exceptional stress in the earlier stress system.

A more appropriate synchronic analysis may be morpho-lexical in character.

  - Vowel length alternations for reduplicated stem are only semi-systematic.
  - The same is true for vowel length in the reduplicant prefix itself.

(77) Alternating stem
  a. / ya[yan]~ / ‘be timid (durative)’
  b. / ?a[yavan]~ / ‘be timid (durative)’

(78) Non-alternating stems
  a. / ?a:ga~ / ‘open one’s mouth (durative)’
  b. / ?a:a:ga~ / ‘open one’s mouth (punctual)’
  c. / ?u:da~ / ‘untie (durative)’
  d. / ?u?:u:da~ / ‘untie (punctual)’

- Suffix variation → prosodically conditioned allomorph selection (e.g. Mascaro 1996, Paster 2006, Wolf 2008, etc.).

(79) Absolute object case suffix [-la(ː)]:
  (i) Select /-la:/ after a light syllable: / tahawi-la:-p / ‘in the summer’
  (ii) Select /-la/ after a heavy syllable: / hani:-la-p / ‘in the house’

- Exceptional cases reduce to lexically-determined allomorphy.
My claim: once the stress system of Tübatulabal changed, it was inevitable that AL would cease to be part of the productive, synchronic phonology.

- Languages are only allotted one system of metrical representation.
- Natural language phonologies lack the expressive power to generate a non-local pattern like AL, unless it can be reconciled with the foot structure needed for stress.
- But AL is not compatible with the stress system of Tübatulabal.
- In the absence of a lengthening-specific foot tier, AL would have become literally unlearnable, at least as a phonological process (e.g. Newport & Aslin 2004; cf. the critical view in Hansson 2011:§7).
- See Werle (2002) for a potentially similar case in Makah.

A worry: is an allomorphy solution appropriate for highly agglutinating languages?

“It is probably not an exaggeration to estimate that any particular stem may enter into 300 suffix combinations and that some suffixes may occur in 25,000 stem-suffix combinations.”

Swadesh & Voegelin (1939:10)

A second worry: processes of limited scope and productivity may still be phonologically determined.

- Exceptional application is a defining trait of ‘early’ lexical phonology (Kiparsky 1982, Kaisse & Shaw 1985, Coetzee & Pater 2011, Bermúdez-Otero 2012, etc.).

(80)

\[
\begin{align*}
\text{a.} & \quad \text{serene} \ [sə\text{'in}] \rightarrow \text{serenity} \ [sə\text{'niri}] \\
\text{b.} & \quad \text{obese} \ [o\text{ubis}] \rightarrow \text{obesity} \ [o\text{ubisiri}] 
\end{align*}
\]

- Some non-productive, lexically-restricted alternations may still be conditioned by purely phonological factors.
  - E.g. [V] ∼ [∅] (yer) alternations in the Russian nominal system (Gouskova 2012, Gouskova & Becker to appear).

9 Conclusion

Huariapano is one of the most plausible cases of a phonological system that employs two independent metrical tiers.

I have argued that this conclusion is premature.

- An analysis of Huariapano making use of just one system of footing actually provides a better account of the prosodic phonology of this language.
• No need for process-specific metrical structure: epenthesi s depends on the feet used to assign stress.
  ○ Stress and coda [h] epenthesi s sometimes coincide because they are determined by the same system of foot structure.
  ○ But stress does not directly condition epenthesi s, so the correlation is only imperfect.

• Parallelisms between stress and epenthesi s exist because both phenomena are conditioned by the same underlying feet.
  ○ On multiplanar accounts of Huariapano, such parallelisms remain unexplained.

If the phonology of Huariapano can be captured with a single system of footing, this casts doubt on the existence of distinct, co-existing metrical systems in any language (see also Churchyard 1999).

• Some putative cases may be analyzable using the same sort of flexible footing that I proposed for Huariapano (e.g. Eastern Mari).

• Other cases are more intransigent, and may require a derivational solution.
  ○ But: any such examples should be carefully inspected, since they may be non-productive or morphological in character (e.g. Tübatulabal).
  ○ Even if derivations are ultimately needed to account for conflicting metrical parses in some language, that doesn’t force us to the conclusion that distinct parses can co-exist in the same phonological representation.


The Uniformity of Footing Hypothesis
Within a single language, there are no discrepancies between the feet that condition stress placement and the feet needed to explain foot-sensitive segmental processes.  

I also identified a novel source of prominence effects in prosodic phonology: the augmentation of foot-initial syllables.

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8 This idea also appears in Dresher & Lahiri (1991) under the name metrical coherence.
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